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EXAMINER	
BELYAEV, YANA	
ART UNIT	PAPER NUMBER
4122	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/574,803	DA SILVA ET AL.	
	Examiner	Art Unit	
	YANA BELYAEV	4122	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 February 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *50-79* is/are pending in the application.

4a) Of the above claim(s) *80-98* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *50-79* is/are rejected.

7)☒ Claim(s) *63,71,76* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 April 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/5/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Claims 80-98 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected composite object, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 24 February 2009.

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 5 April 2006 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Specification

2. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 63, 71, and 76 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 63 recites the limitation "producing an electrochemical cell" in the second line of the claim. There is insufficient antecedent basis for this limitation in the claim. The examiner has interpreted claim 63 to read, "The method as claimed in claim 50 for producing a composite object..."

Claim 71 recites the limitation "producing mold" in the first line of the claim. There is insufficient antecedent basis for this limitation in the claim. The examiner has interpreted claim 71 to read, "The method as claimed in claim 50 for producing a composite object..."

Claim 76 recites the limitation "producing a heliothermal converter " in the second line of the claim. There is insufficient antecedent basis for this limitation in the claim. The examiner has interpreted claim 76 to read, "The method as claimed in claim 50 for producing a composite object..."

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 50-51, 63, 65, 69, and 71-72 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent 6,458,418 (Langer hereinafter).

Regarding claims 50-51, 63, and 71, Langer discloses a method for producing a composite object comprising at least two distinct parts having different properties and/or functions (column 6, lines 1-7), which comprises: forming at least one layer comprising about 20 percent to about 90 weight percent, which is more than 70 weight percent, of an expanded material selected from expanded graphites (column 7, lines 29-33), forming at least one other layer comprising up to 90 weight percent, which is more than 70 weight percent, unexpanded vermiculites (column 9, lines 30-31 and 34-38), and then compressing together the layers so formed so as to consolidate them, each consolidated layer corresponding to one of the parts of the object (column 14, lines 58-60), wherein the layers are formed to be adjacent (Figure 2) and the layers alternate between layers primarily composed of expanded graphite and layers primarily composed of expanded vermiculite (Figure 2).

Regarding claim 69, since Langer discloses that if the claimed invention is used as a pollution control device, such as a catalytic converter

or a diesel particulate filter, then each layer of graphite formed contains a catalyst (column 13, lines 5-7), but makes no teaching of if that claimed invention is not used as a pollution control device, therefore it is the position of the examiner that catalysts are not always present, which meets the instant claim limitation of "less than 20 weight percent of a catalytic material."

Regarding claim 72, Langer discloses that the layers formed are compressed together in such a manner that the consolidated layer of graphite has a density of greater than preferably 0.45 g/cc (450 kg/m^3), which is greater than 100 kg/m^3 (Column 14, lines63-67).

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claim 65 is rejected under 35 U.S.C. 103(a) as being unpatentable over Langer as applied to claims 50-51, 63, 65, 69, and 71-72 above, and further in view of US Patent Application Publication 2002/0164457 (Klug hereinafter).

The teachings of Langer are detailed in the rejection of claims 50-51, 63, 65, 69, and 71-72 under 35 USC 103(a) above.

Regarding claim 65, Langer does not disclose that the consolidated layers of graphite have a density of from 30 to 60 kg/m^3.

Klug discloses that the density of the consolidated graphite sheet material is from about 0.04 to about 1.4 g/cc, which is equivalent to 40 to 1400 kg/m^3. Klug further discloses that the density and thickness of the sheet material can be varied by controlling the degree of compression (paragraph 10).

It would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the consolidated layers of graphite to a density of from 30 to 60 kg/m^3. The rationale to do so would have been the motivation provided by the teaching of Klug that to consolidate the layers of

graphite to that density would predictably ensure that the graphite layer exhibited an appreciable degree of anisotropy due to the alignment of graphite particles parallel to the major opposed, parallel surfaces of the sheet (paragraph 10). It has been held that where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation (*In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955)).

4. Claim 62 is rejected under 35 U.S.C. 103(a) as being unpatentable over Langer as applied to claims 50-51, 63, 65, 69, and 71-72 above, and further in view of US Patent 5,736,109 (Howorth hereinafter).

The teachings of Langer are detailed in the rejection of claims 50-51, 63, 65, 69, and 71-72 under 35 USC 103(a) above.

Regarding claim 62, Langer discloses that the layer of vermiculite formed can include additives such as defoaming agents, surfactants, dispersants, etc in amounts of less than about 5 dry weight percent (column 11, lines 43-48), which is less than 30 weight percent. Langer does not specifically state, other than broad categories, which materials can be used as additives.

Howorth discloses that perlite is an additive commonly used to reduce the compression pressure during the initial heating of the catalytic converter

when the intumescent agents expand. Perlite would collapse to prevent excessive pressure from building (column 6, lines 17-27)

It would have been obvious for one of ordinary skill in the art at the time of the invention to use perlite as an additive in the layer of vermiculite. The rationale to do so would have been the motivation provided by the teaching of Howorth that to do so would predictably prevent intumescent agents in the layer of Vermiculite from expanding (column 6, lines 17-27).

5. Claims 52-59 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Langer as applied to claims 50-51, 63, 65, 69, and 71-72 above, and in view of US Patent 3,389,200 (Olstowski hereinafter).

The teachings of Langer are detailed in the rejection of claims 50-51, 63, 65, 69, and 71-72 under 35 USC 103(a) above.

Regarding claims 52-55 and 64, Langer does not disclose that the layers formed are compressed together according to several directions, specifically three orthogonal directions. Langer further does not disclose that the layers formed are compressed according to a single direction, wherein the direction of compression is substantially orthogonal with respect to an interfacial plane between said layers.

Olstowski discloses that the layers formed are compressed according to several directions, specifically three orthogonal directions (column 2, lines 11-14).

Olstowski further discloses that the layers formed are compressed according to a single direction (column 2, lines 1-4). Olstowski further teaches that compression along a single axis (uniaxially) will produce a compact integral structure having high electrical and thermal anisotropy. Both electrical and thermal resistivity are highest in the direction of compression and lowest in the direction perpendicular to that of compression (column 2, lines 1-6). Thus, by making the single direction of compression substantially orthogonal with respect to an interfacial plane between said layers, all of the layers since all layers are substantially parallel to the interfacial plane between said layers, will readily allow the movement of electrical and thermal charge in the same direction.

Thus, while Olstowski does not disclose that the direction of compression is substantially orthogonal with respect to an interfacial plane between said layers, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the direction of compression substantially orthogonal with respect to an interfacial plane between said layers. The rationale to do so would have been the motivation provided by the teaching of Olstowski that to do so would predictably make the electrical

and thermal resistivity lowest in the direction substantially parallel to the interfacial plane between said layers.

Regarding claims 56 and 57, Langer does not disclose that the layers formed are subjected to a single compression operation, specifically a single compression operation according to each direction (A,B,C).

Olstowski discloses that the structure is compressed along one axis and then compressed along the axis which are at right angles to the first compression axis (column 2, lines 26-31).

It would have been obvious for one of ordinary skill in the art at the time of the invention to have the layers formed subject to a single compression operation according to each direction which are at right angles to the first compression axis. The rationale to do so would have been the motivation provided by the teaching of Olstowski that to do so would predictably prevent swelling in just one direction, which would narrow the distance between electrodes (column 2, lines 20-24).

Regarding claims 58 and 59, Langer also does not disclose that the layers formed are subjected to a plurality of distinct compression operations according to at least one direction, wherein according to that direction, a first compression operation suitable for consolidating the layers formed and, subsequently, a second compression operation suitable for conferring a desired density on one of said layers.

Olstowski discloses that the structure is subject to a first compression operation along one axis (column 2, lines 18-27) and, subsequently, a second compression operation suitable for conferring a desired density to the compact (column 2, lines 37-42).

It would have been obvious for one of ordinary skill in the art at the time of the invention to have the layers formed subject to a plurality of distinct compression operations according to at least one direction and, subsequently, a second compression operation suitable for conferring a desired density to the compact. The rationale to do so would have been the motivation provided by the teaching of Olstowski that to do so would predictably produce a compact integral structure having high electrical and thermal anisotropy by subjecting the layers formed to a first compression operation in one direction (column 2, lines 1-4), and then a second compression operation in that direction to increase the density of the layer (column 2, lines 37-39).

6. Claims 60, 68, and 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Langer as applied to claims 50-51, 63, 65, 69, and 71-72 above, and further in view of US Patent Application No 2002/0192457 (Temme hereinafter).

The teachings of Langer are detailed in the rejection of claims 50-51, 63, 65, 69, and 71-72 under 35 USC 103(a) above.

Regarding claims 60, 68, and 75, Langer does not disclose impressing into at least one face of at least one layer of graphite open recess forms having at least one front dimension of from 1 μm to 5mm and a depth of 1 μm to 1 mm or at least one front dimension of from 1 mm to 2 cm and a depth of 1 mm to 10 cm.

Temme, however, discloses impressing holes into at least one face of at least one layer of graphite (paragraph 32) having a diameter of about 0.1 mm (paragraph 34) and of varying depth (paragraph 41). However, since Temme uses the term "hole" to refer to any opening or passage capable of providing fluid communication from an exterior surface to internal portions (paragraph 32), the depth of the hole can be up to 4 mm since Example 1 (paragraph 75) discloses a graphite layer of 4 mm.

While Temme does not disclose holes having at least one front dimension of from 1 μm to 5mm and a depth of 1 μm to 1 mm or at least one front dimension of from 1 mm to 2 cm and a depth of 1 mm to 10 cm, Temme does disclose that any suitable diameter hole is useful, but the formation of larger diameter holes may result in cracking of the graphite sheet along the layered planes of carbon atoms.

Since Langer and Temme combine to teach the same materials processed under the same conditions as instantly claimed, one of ordinary skill in the art at the time the invention was made would have expected the graphite recessed forms of the Langer/Temme invention to intrinsically be capable of trapping infrared waves as instantly claimed.

Therefore it would have been obvious for one of ordinary skill in the art to optimize the dimensions of open recess forms which are impressed into at least one face of at least one layer of graphite since it has been held that where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation (*In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955)).

7. Claims 61 and 72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Langer as applied to claims 50-51, 63, 65, 69, and 71-72 above, and further in view of International Patent Publication Number 02/069415 (Mercuri hereinafter).

The teachings of Langer are detailed in the rejection of claims 50-51, 63, 65, 69, and 71-72 under 35 USC 103(a) above.

Regarding claim 61, Langer does not disclose that wherein there is used as expanded graphite an expanded natural graphite.

Mercuri discloses that natural graphites can be treated so that the spacing between the superposed carbon layers or laminae can be appreciably opened up so as to provide a marked expansion in the direction perpendicular to the layers (page 3, paragraph 2).

It would have been obvious for one of ordinary skill in the art at the time of the invention to use expanded natural graphite. The rationale to do so would have been the motivation provided by the teaching of Mercuri that to do so would predictably be able to treat the natural graphites in such a way as to allow for a marked expansion in the direction perpendicular to the layers (page 3, paragraph 2).

Regarding claim 72, Langer does not disclose that the consolidated layer of graphite has a density greater than 100 kg/m^3.

Mercuri discloses the density of the graphite sheet material can be within the range of from about 0.08 g/cc to about 2.0 g/cc, which is equivalent to 80-2000 kg/m^3 (page 4, paragraph 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have a layer of graphite have a density greater than 100 kg/m^3. Since it has been held that where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation (*In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955)).

8. Claims 66, 67, 73, 74, 76, 77 and 78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Langer as applied to claims 50-51, 63, 65, 69, and 71-72 above, in view of Mercuri, and further in view of US Patent 5,385,700 (Denton hereinafter).

The teachings of Langer are detailed in the rejection of claims 50-51, 63, 65, 69, and 71-72 under 35 USC 103(a) above.

Langer does not disclose placing destructible or removable threads or tubes into the layer of graphite or in between the layer of graphite and layer of vermiculite during their formation, said threads or tubes being destroyed or removed once the layers have been consolidated. Furthermore, Langer does not disclose creating channels suitable for receiving a heating/cooling fluid in the layer of expanded graphite.

Mercuri discloses that fluid microgrooves (see claim 7) are formed on one face of expanded graphite that is oriented towards the adjacent layer (page 11, paragraph 3). Mercuri does not disclose how the microgrooves are formed.

Denton discloses placing a removable core in the layer of the ceramic material to be formed, said core being removed once the layer ceramic material is consolidated (see abstract).

Regarding claim 66, 76, 77 and 78 it would have been obvious for one skilled in the art at the time of the invention to form the fluid microgrooves disclosed by Mercuri and apply them to the composite material disclosed by Langer. The rationale to do so would have been the motivation provided by the teaching of Mercuri that to do so would have predictably created microgrooves which are customizable as to the placement of microgroove, microgroove density and shape in order to equalize fluid pressure along the surface of the electrode when in use (Mercuri, page 12, paragraph 2).

Further, it would have been obvious for one skilled in the art at the time of the invention to use the method disclosed by Denton to form microgrooves in the composite material disclosed by Langer. The rationale to do so would have been the motivation provided by the teaching of Denton that to do so would have predictably enabled the construction of microgrooves suitable for holding active electrode material in a high temperature rechargeable electrochemical power storage cell (Denton, column 1, lines 6-11).

Regarding claim 67, 73, and 74 it would have been obvious to one of ordinary skill in the art at the time of the invention to use the fluid microgrooves in the layer of expanded graphite, as disclosed by Mercuri and Denton, to receive a cooling fluid. The rationale to do so would have been

the motivation provided by the teaching of Mercuri that to do so would have predictably cooled the expanded graphite sheet when if it is resin-impregnated to avoid heat damage to the resin system (Mercuri, page 5, paragraph 65)

9. Claim 79 rejected under 35 U.S.C. 103(a) as being unpatentable over Langer in view of Mercuri and in further view of Denton as applied to claims 66, 67, 73, 74, 76, 77 and 78 above, and further in view of Temme.

The combined teachings of Langer, Mercuri, and Denton are detailed in the rejection of claims 66, 67, 73, 74, 76, 77, and 78 under 35 USC 103(a) above.

Regarding claim 79, None of Langer, Mercuri, and Denton discloses impressing into at least one face of at least one layer of graphite open recess forms having at least one front dimension of from 10 μm to 1 cm and a depth of 1 mm to 1 cm.

Temme, however, discloses impressing holes into at least one face of at least one layer of graphite (paragraph 32) having a diameter of about 0.1 mm (paragraph 34) and of varying depth (paragraph 41). However, since Temme uses the term "hole" to refer to any opening or passage capable of providing fluid communication from an exterior surface to internal portions (paragraph 32), the depth of the hole can be up to 4 mm since Example 1 (paragraph 75) discloses a graphite layer of 4 mm.

While Temme does not disclose holes having at least one front dimension of from 10 μm to 1 cm and a depth of 1 mm to 1 cm, Temme does disclose that any suitable diameter hole is useful, but the formation of larger diameter holes may result in cracking of the graphite sheet along the layered planes of carbon atoms.

Therefore it would have been obvious for one of ordinary skill in the art to impressing into at least one face of at least one layer of graphite open recess forms as disclosed by Temme and to then optimize the dimensions of open recess forms which are impressed into at least one face of at least one layer of graphite. The rationale to do so would have been the motivation provided by the teaching of Temme that to do so would predictably facilitate the infusion of sealant into the expanded graphite sheet (see abstract). Furthermore, it has been determined that where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation (*In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955)).

10. Claim 70 is rejected under 35 U.S.C. 103(a) as being unpatentable over Langer as applied to claims 50-51, 63, 65, 69, and 71-72 above, and in further view of US Patent 4,504,582 (Swann hereinafter).

The teachings of Langer are detailed in the rejection of claims 50-51, 63, 65, 69, and 71-72 under 35 USC 103(a) above.

Regarding claim 70, Langer does not disclose that wherein the layer of vermiculite formed comprises lyophilized enzymes.

Swann discloses a method for entrapping biological material, including enzymes, within vermiculite (column 2, lines 6-9).

It would have been obvious for one of ordinary skill in the art to have the layer of vermiculite comprising lyophilized enzymes. The rationale to do so would have been the motivation provided by the teaching of Swann that to do so would predictably prepare a composite which results in very little loss of activity in the enzyme in such a way that the composite still exhibits excellent strength and durability (column 2, lines 10-18).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YANA BELYAEV whose telephone number is (571)270-7662. The examiner can normally be reached on M-Th 8:30am - 6pm; F 8:30 am- 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Milton Cano can be reached on 571-272-1398. The

fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Y. B./
Examiner, Art Unit 4122

/Timothy J. Kugel/
Primary Examiner, Art Unit 1796